

FISHERIES

Introduction

The Logan Creek area was once home to a westslope cutthroat trout population (*Oncorhynchus clarki lewisi*) and may also have contained a small population of bull trout (*Salvelinus confluentus*) and other native species. Brook trout (*Salvelinus fontinalis*), rainbow trout (*Oncorhynchus mykiss*), and lake trout (*Salvelinus namaycush*) are all introduced species that now dominate the area and provide the bulk of the recreational fishery. These introduced fish have effects on native fish. Cutthroat trout are now found in just a few tributaries (Pike and Sanko Creeks) and are vulnerable to disappearing from the area altogether. Historically, bull trout were likely rare within Logan Creek, and their current presence is uncertain.

Fish habitat, characterized by stream channel dimensions, substrate composition, migration barriers, large woody debris, and pool habitat, has also experienced a subtle decline in quality due to past land management activities. The evidence of this decline is highly variable within the watershed, with some areas, for instance, displaying a lack of large woody debris and pool habitat, while other reaches have an abundance of these attributes. The source of habitat decline is believed to be primarily from the existing road system and lingering effects of historic timber harvests.

Differences Between the DEIS and FEIS

This Fisheries section in the FEIS differs from the same section in the DEIS in that analysis for the new Alternative F was included. Also, some paragraphs were rearranged to create a more logical flow of ideas. A new paragraph was written to better explain the decrease in cutthroat trout populations after introduction of brook trout in the 1940s and '50s, and a few sentences were added in several places to better explain various points. New field surveys conducted during the summer of 2003 provide additional data regarding the health of the stream environment. These recent surveys also indicate fewer culverts restrict fish passage than was stated in the DEIS. A typographical error regarding road densities in the Sanko Creek sub-watershed was corrected from 1.7 miles per square mile to 1.9 miles per square mile.

Another notable change in the FEIS version of the Fisheries section is that the environmental consequences of all the action alternatives were presented under each of the five parameters relevant to fisheries (stream channel dimensions, substrate composition, fish migration barriers, pools, and large woody debris). This reorganization was done to avoid redundancy and to enable readers to more easily compare the effects of the action alternatives.

Information Sources

The Forest Service has conducted fish population inventories throughout the analysis area since 1980. To date, over 80 electrofishing and snorkeling surveys have taken place within the analysis area. These surveys follow established protocols that allow population estimates from the survey to characterize a larger stream reach. The Forest Service does not survey Tally Lake itself, so the Montana Department of Fish, Wildlife, and Parks has provided this information. There is no quantifiable information on the status of fish populations prior to 1980.

The Forest Service began surveying fish habitat in the Logan Creek area in 1989. All habitat surveys and a map showing location can be found in Exhibit F-1. In 1989, a cursory survey of upper Logan Creek described spawning habitat conditions and stream sizes in general terms, but collected little quantifiable or repeatable data. In 1993 a new habitat survey began at the Road 313 bridge, but surveyed only about one mile of river. This survey resumed in 1999 and collected data for the length of stream up to the confluence of Cyclone Creek. A 1996 survey examined middle Logan Creek above Tally Lake to the waterfalls. Portions of Evers Creek that are on public lands were surveyed in 2001.

Most of these surveys were initial assessments rather than monitoring projects that provide comparison data to track change over time. One exception is an 800-meter stretch of Logan Creek just above the Road 313 bridge. This stretch was surveyed in 1993 and then again in 1999. The only other monitoring information available is trends from a few channel cross-sections described in the Water Resources section.

There is no historical fish habitat condition information that describes what the watershed was like before land management activities began. Some items, such as pool frequency and large woody debris, can be compared to streams in pristine condition to determine a historical range of variability (Exhibit F-6). In other situations, the historical range of variability is not known, and therefore fish habitat is judged by how well it supports management indicator species (bull trout and westslope cutthroat trout). It is assumed that if a system can support management indicator species, then it is equally capable of supporting other fish species common to the system.

The Flathead National Forest and the Montana Department of Environmental Quality conducted a joint survey of Logan Creek above Tally Lake during the summer of 2003. The purpose of this effort was to gather data regarding the condition of the aquatic community in the stream in order to determine the disposition of the stream with regard to the Clean Water Act 303(d) list of impaired streams. In 2002, Logan Creek above Tally Lake was on Appendix F of the list, indicating the need for additional data regarding aquatic life in the watershed. The results of this survey are contained in Exhibit F-12 with appendices.

Analysis Area

Logan Creek is a large and complex fisheries resource. For purposes of this analysis the affected area will include the entire Logan Creek drainage and will be discussed in terms of three different sections:

- The “upper” Logan Creek section includes the headwaters of Logan Creek, Star Meadow, and downstream to the waterfalls on Logan Creek three miles above Tally Lake. The waterfalls consist of several cascades about 1 meter high. They typically act as a barrier to upstream fish passage, but there may be occasional flow conditions that allow fish to get beyond it.
- The “middle” Logan Creek section includes the three miles of stream between the falls and Tally Lake. Presumably, fish from Tally Lake ordinarily ascend only as far as the falls for spawning and rearing habitat. There are no other tributaries entering Tally Lake that offer fish habitat.
- Everything downstream of Tally Lake is referred to as “lower” Logan. Fish in this section are connected to populations of fish in the Stillwater River and Tally Lake, but it is unlikely that fish travel downstream from the lake to spawn or rear.

These three sections are not disjunct from each other; they are delineated to help clarify discussion of the analysis area.

The cumulative effects area includes all watersheds accessible to fish populations originating from the Logan Creek affected area. Fish are able to move freely between Logan, Sheppard, and Griffin Creek drainages. Thus it is possible that impacts to a certain fish population in Reid Creek, for example, could impact the larger, cumulative, connected fish population of Logan, Sheppard, and Griffin Creeks. The entire Tally Lake and Logan/Griffin/Sheppard Creek drainage includes about 139 miles of fish habitat, plus Tally Lake itself. For the sake of clarity, this cumulative effects area will be called “Tally Lake drainage.”

It is possible that fish from lower Logan Creek can move freely into Good Creek or downstream to the Stillwater River and the rest of the Flathead Lake basin, except where they are blocked by dams at Hungry Horse and Bigfork. This is a very large cumulative effects analysis area at well over 2.6 million acres. Potential cumulative effects would be most likely noticeable at the “Tally Lake drainage” scale and less so at the Flathead Lake basin scale.

Affected Environment

Existing Condition of Fish Populations

Although quantifiable population data do not exist, we can assume that populations of westslope cutthroat trout (a species native to Montana) were originally numerous and healthy in the Tally Lake drainage, as well as everywhere else in the Flathead Basin. However, when brook trout (native of the eastern U.S.A.) were introduced here in the 1940s and ‘50s, the resulting competition with brook trout reduced the population numbers of cutthroat trout in the Logan Creek drainage. Today, relatively abundant cutthroat trout populations occur only

where brook trout are absent. In fact, competition with brook trout is the most important limiting factor for cutthroat trout in the Logan Creek drainage.

The cutthroat trout population traveled freely between Logan, Griffin, Sheppard, and every other tributary above the waterfall on Logan Creek about three miles above Tally Lake. A population such as this is considered a “metapopulation,” or group of smaller subpopulations that occasionally have individuals migrating between them. Usually each subpopulation kept to itself. For example, the fish reared in Reid Creek were a subpopulation and only reproduced with other fish from Reid Creek. Occasionally, individuals migrated, and genetic exchange could occur between Reid Creek and other related drainages. When a disturbance (such as a wildland fire) hampered the subpopulation of a small stream, some individuals from nearby unaffected populations mingled and help rebuild the impacted population. Metapopulations can thrive as long as fish are able to migrate freely and as long as not too many subpopulations are simultaneously threatened. Conservation biology has generally accepted the notion that bull trout and cutthroat trout operate in metapopulation dynamics because these species can have a migratory life history form capable of migrating long distances (Rieman and McIntyre 1995; Dunham and Rieman 1999).

Tally Lake is a deep, oligotrophic (nutrient poor) lake. During prehistoric times, Tally Lake probably drained into Lost Creek, but this channel is now closed. Today, Logan Creek is the only major inlet and outlet to the lake. There are other small tributaries that enter Tally Lake, but they do not have fish habitat. Both the inlet and outlet are located on the north shore and are situated only one mile apart from each other. The rest of the lake has very little water exchange and is generally unproductive (fish grow very slowly). The majority of water volume is too deep, sterile, and cold to grow fish. This is a natural condition.

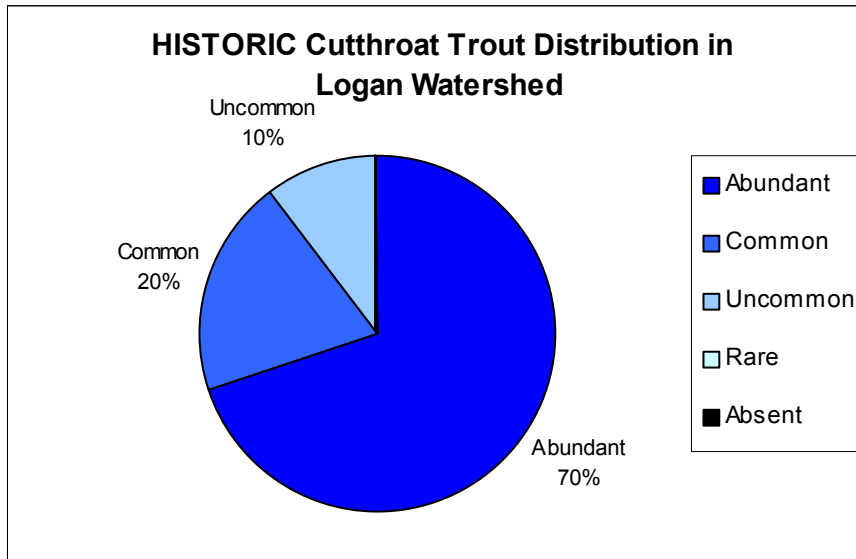
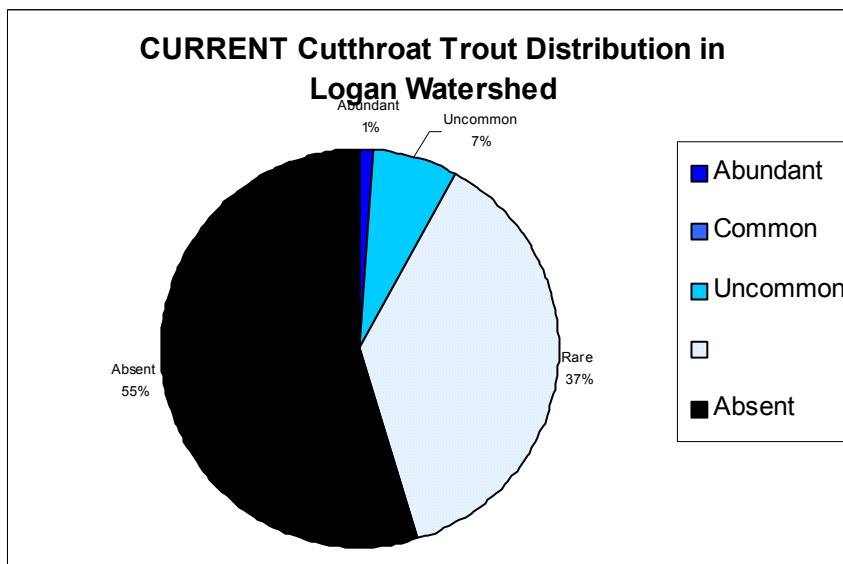
The native fish of Tally Lake were northern pikeminnow (*Ptychocheilus oregonensis*) (previously known as squawfish), suckers (*Catostomus* spp), bull trout, and cutthroat trout. All of these species presumably ascended Logan Creek to spawn up to the waterfalls. It is unlikely these species traveled downstream to spawn. Exotic fish dominate Tally Lake today. The lake consists of (in order of abundance) kokanee salmon (*Oncorhynchus nerka*), northern pikeminnows, suckers, lake trout, brook trout, northern pike (*Esox lucius*), and occasional rainbow trout (M. Deleray, personal communication, 2002). Tally Lake is a popular place for recreational boating, but is not known for good fishing.

Cutthroat Trout

Today, the cutthroat trout metapopulation of the Tally Lake watershed is greatly diminished, consisting of only a few scattered remnant populations. In the Logan Creek area, cutthroat trout are especially reduced in numbers. Figures 3-7 and 3-8 illustrate the dramatic decline of fish habitat occupied by cutthroat trout from estimated historic to current conditions. Project File F-5 details the information used to make these figures.

There are still small populations in upper Sheppard and Griffin Creeks, although the latter were likely stocked in the 1950s from a hatchery source of unknown purity and may therefore not be a 100 percent pure population. The Griffin Creek population is found in a stream reach above the waterfall that has extremely poor fish habitat. Restoration efforts are underway to

protect and stabilize the upper Sheppard Creek population by manually removing all the brook trout by means of electrofishing.

Figure 3-7**Figure 3-8**

In the Logan Creek area, only the small tributaries “Pike Creek” and Sanko Creek still have cutthroat trout. Pike Creek is an unnamed stream west of Taylor Creek that has been informally named by Tally Lake Ranger District employees, and it is also referred to as “Logan Tributary # 1.” These are very small streams, and each population may have less than 200 individuals. Johnson Creek has yet to be inventoried, but is extremely unlikely to still contain cutthroat trout, based on the professional judgment of the district fish biologist. Occasionally cutthroat trout are captured in Logan Creek itself; these may be strays from elsewhere. A map of existing fish distribution is in Exhibit F-5, along with the population information and interpretation used to assemble this information.

The following table displays the percentage of fish habitat that is occupied by cutthroat trout.

Table 3-47. Fish Habitat Occupancy by Cutthroat Trout.

	Percentage of Logan Area	Percentage of overall Tally Lake Watershed
Abundant	1 %	1 %
Common	0 %	14 %
Uncommon	7 %	12 %
Rare	37 %	35 %
Absent	55 %	38 %

The 2001 Logan Creek Ecosystem Analysis at Watershed Scale (Exhibit A-1) determined priorities for streams for cutthroat restoration. Sheppard and Griffin Creeks are high priority; Logan Creek is low due to the extreme scarcity of cutthroat trout in that system. Cutthroat trout restoration is not a part of the purpose and need of this project. However, the Forest Service still seeks to protect what cutthroat trout are left and to provide good fish habitat, regardless of the species. These obligations are detailed in the regulatory framework narrative.

The decline of westslope cutthroat trout is continuous across their range. Westslope cutthroat trout distributions have decreased to the extent that viable populations of this species are estimated to occur in only 8 percent of their historical range in Montana (Van Eimeren 1996). There are four primary reasons for cutthroat trout decline: competition from exotic species, hybridization with exotic species, habitat degradation, and over-fishing (Liknes and Graham 1988). Exotic species, namely brook trout and rainbow trout, are present in the Logan Creek drainage. The role of habitat degradation will be reviewed in the next section of this document. It is possible that decades ago, over-fishing may have also harmed cutthroat trout, but this is no longer a factor, as nearly all recreational angling in this area focuses on introduced species.

Non-native rainbow trout were introduced to the Flathead Valley about 50 years ago, spread up Logan Creek, over the cascades, and now extend to about the Star Meadow area. It is uncertain why rainbow trout have not yet colonized into Star Meadow, but perhaps the natural slow-moving waters and warm temperatures discourage rainbow trout invasions. Rainbow trout readily hybridize with cutthroat trout, posing a serious threat to the genetic integrity of this native species. Cutthroat trout in Sheppard Creek have tested pure, but no other genetic information exists in the Tally Lake area. The occasional cutthroat trout found in lower

Logan Creek are very likely hybridized, due to the abundance of rainbow trout. It is possible the cutthroat trout in Pike and Sanko Creeks are still pure, as rainbow trout have not penetrated these streams.

Non-native brook trout were stocked directly into Logan Creek decades ago by well-meaning fish biologists. The unexpected consequences of their actions are that brook trout have spread throughout nearly every foot of available fish habitat in Logan Creek and have out-competed the native cutthroat trout. Brook trout are currently found in 86.4 percent of the Tally Lake watershed (93 percent of Logan Creek analysis area). An electroshocking survey conducted in the summer of 2003 indicated that the brook trout population in Logan Creek is very healthy, with all age classes well represented and in excellent condition (Exhibit F-12). Regionally, brook trout are now second only to rainbow trout as the most widely distributed salmonid species throughout the interior Columbia Basin (Adams et al. 2000).

Biologists have begun to answer the question of how brook trout out-compete cutthroat trout. Novinger and Rahel (1999) recently verified that juvenile cutthroat trout experience reduced growth rates when they dwell with the larger, more aggressive juvenile brook trout. The question remains: Do brook trout actively invade and push out cutthroat trout or do they simply utilize degraded habitat conditions more effectively (McIntyre and Rieman 1995)? This is a critical gap in information.

On one hand, it appears the Logan Creek has all the natural channel types that give brook trout that advantage over cutthroat trout, regardless of any land management. Studies have found that brook trout can invade almost any stream, no matter how steep, but seem to only do best in smaller channels with slightly warmer temperatures (Adams 1999). Empirical evidence on the Flathead National Forest has also found that brook trout tend to be more abundant in lower gradient areas. Logan Creek has these characteristics. It could be that brook trout simply invaded and displaced the cutthroat trout due to natural channel conditions.

But it is also possible that subtle habitat degradation played a role. There is some evidence that brook trout invasion may be facilitated by habitat degradation (Dunham et al 2002). Cutthroat trout can persist in spite of brook trout in some streams (Rieman et al 1999) and this may be due to high quality habitat. Native fish generally tend to do better in watersheds with relatively little land management (Quigley and Arbelbide 1997). There are several streams on the Flathead National Forest that cutthroat trout have persisted, even in a channel conditions that would otherwise seem to benefit brook trout. This implies that the successful invasion of brook trout in Logan Creek could be due to, at least in part, land management. It could be that brook trout did not push out the cutthroat trout, they simply adapted better to reduced habitat quality.

Although fish habitat quality in Logan Creek is not optimal (see discussions below), it is unclear whether this deficiency resulted in the automatic replacement of cutthroat trout by brook trout. Cutthroat trout will not regain any habitat in Logan Creek without human intervention. There is no known example where cutthroat trout suddenly out-competed brook trout, regardless of habitat quality. Improving fish habitat, by itself, would not lead to native fish restoration in the Logan Creek area.

Bull Trout

Bull trout may have been extirpated in Tally Lake. The last known bull trout caught in the Lake was in 1985 (M. Deleray, personal communication, 2002). Decades ago fish biologists stocked non-native lake trout in Tally Lake. Unfortunately, this resulted in lake trout preying on native bull and cutthroat trout. However, because it is difficult to prove absence, it is assumed in this analysis that some bull trout still exist in Tally Lake. Logan Creek provides potential spawning and rearing habitat.

There is some uncertainty about how bull trout historically used Tally Lake. One theory is that bull trout never spawned in this watershed at all, but only used Tally Lake for seasonal foraging. On the other hand, monitoring by the Montana Department of Fish, Wildlife, and Parks occasionally found spawning redds in Logan Creek, but there is some uncertainty about whether these were actually bull trout redds. If so, it implies the bull trout population in Tally Lake was primarily disjunct and self-sustaining, just like many other lakes in the Flathead Valley.

Other Species

Aquatic communities are comprised of a prolific array of plant and animal species, with fish at the top of the food chain. Amphibian species such as frogs, toads, and salamanders depend on the aquatic environment for part or all of their life cycle. Macroinvertebrates (primarily large aquatic insects) occupy a variety of niches in most streams and are a principal prey item for trout. Periphyton is a mixture of small plants and animals that typically dwell on the substrate in the stream bottom, mostly microscopic and unnoticed except by the anglers who lose their footing on a slick rock in the streambed. Macrophytes are aquatic plants most commonly found in the still water of lakes and ponds. Together, these various constituents of the aquatic community can provide us with a tool for assessing the health and integrity of a water body.

The Flathead National Forest has for several years conducted amphibian surveys across the forest, including in the Logan Creek watershed. In addition, any amphibians observed during stream or fish surveys are generally noted on survey forms. An examination of the surveys conducted in Logan Creek reveals numerous observations of spotted frogs, western toads, and garter snakes, the most common species in Northwest Montana (information on file at the Tally Lake Ranger District office).

Macroinvertebrate and periphyton data were collected in Logan Creek in 2003 by biologists from the Flathead National Forest and the Montana Department of Environmental Quality. The samples collected were sent to independent laboratories for analysis aimed at assessing the integrity of the watershed. These segments of the aquatic community have been demonstrated as being particularly sensitive to degradation in the watershed. These analyses concluded that there was no impairment in Logan Creek that was impacting either macroinvertebrates or periphyton, indicating that water quality in the stream remains very good (Exhibits F-11 and F-12).

Existing Condition of Fish Habitat

Fish habitat in the Logan Creek analysis area is in good condition, but not optimal condition. The majority of streams pass through undeveloped forested areas. Water quality is good and the streams are not limited by dissolved oxygen, pH, or excessive nutrients. All streams of sufficient size are capable of supporting coldwater fish (trout). The streams are cold, clear, and generally provide habitat of adequate quality to fully support native fish and other aquatic organisms.

Fish habitat has experienced subtle degradation in the past century that would not be apparent to the casual observer. As described in the Water Resources section, Logan Creek area streams have experienced increases in water yield and sediment yield from timber harvest and road construction. Furthermore, some road culverts have become barriers to fish migration. Historic, turn-of-the-century logging drives may have dramatically altered “lower” Logan Creek. Active cattle grazing on lower Logan, Griffin, Squaw Meadow, and Sheppard Creeks may cause stream banks to break down, leading to increased sediment levels and width/depth ratios.

Five components are used to characterize fish habitat in the Logan Creek area and will be discussed separately in the following paragraphs:

- stream channel dimensions
- substrate composition
- fish migration barriers
- pool habitat
- large woody debris

Stream Channel Dimensions

Stream channel dimensions will be evaluated for all alternatives because this feature of streams is likely to be affected by implementation of any of the alternatives.

Streams are dynamic. Natural events such as fires or floods can lead to a short-term increase in water yield, channel instability, and sediment loads, but over time effects from these events dissipate as vegetation recovers. Harvesting timber may affect streams in a similar way, by increasing water yield and decreasing channel stability until the trees grow back. Roads likewise may impact streams in a similar manner, and their effects last as long as the road exists. Streams can adapt to a moderate level of disturbance, but if too much activity occurs, streams experience peak flows outside of the range of natural variation. Increased water volume erodes stream banks making channels wider and shallower. Bedload deposition increases rendering the overall channel “unstable.”

Streams with the most productive trout habitat tend to be narrow, deep streams. Trout numbers decline in wide, shallow streams because they have little hiding cover, fewer pools, and are vulnerable to solar heating in the summer and ice buildup in the winter. Stream channels, such as a Rosgen A channel type that flow through tight canyon walls, are typically stable and can provide good fish habitat. Other Rosgen channel types (B and C types) are

more vulnerable to forces that can change and degrade fish habitat. See the Water Resources section for a discussion of Rosgen channel types.

There are several ways to examine a stream and its channel dimensions:

- A width/depth ratio is a dimensionless figure derived from dozens, or even hundreds, of measurements of the stream width divided by the average depth. The lower the number, the narrower and deeper the stream; therefore, lower numbers indicate good fish habitat. The Inland Native Fish Strategy (nicknamed INFISH) was developed by the Forest Service to protect riparian areas, and it established various goals for riparian condition. INFISH recommends all streams have a width/depth ratio less than 10 (USDA Forest Service 1995b). Streams with ratios greater than 10 are considered to have poor habitat. However, these standards were developed primarily in the Cascade Mountain Ecoregion, and experience on the Flathead National Forest suggests that a ratio of 10 is too low a target for streams in this region.
- Stream banks are also visually examined and recorded as stable as long as they are not slumping or collapsing into the stream. Raw, eroding stream banks can indicate a widening, less stable stream. A reference database of similar streams in unmanaged, natural conditions provides a basis for comparison (Exhibit F-6).
- In addition to the above fish habitat data, the district hydrologist has collected monitoring data to track channel conditions over time. Several carefully marked and measured transects across a stream serve as cross-sections in the analysis area. Channel modifications at these select sites represent overall stream conditions. Cross-sections established and monitored since 1992 in Logan Creek have not detected substantial channel migration at any site. In addition, the Pfankuch channel stability rating “scores” a stream based on several visual observations. Most Pfankuch surveys conducted in Logan Creek and its tributaries have rated channel stability as “good.” The Water Resources section describes these methods and results.

Table 3-48 displays the indicators of stream channel dimension information for the Logan Creek area. In-stream segments without information are listed as “unknown.” Other streams have had stability ratings, but are not detailed here. The key finding for stability ratings, which is discussed in the Water Yield subsection of the Water Resources section of Chapter 3, is that most streams are stable, but Reid, Pike, Cyclone, and Bill Creeks did experience some instability in the 1970s.

Table 3-48. Stream Channel Dimension Indicators for Logan Creek

Stream	Width/Depth Ratio	Cross-sections	Pfankuch stability	Conclusion
“Lower” Logan	Unknown	Monitoring found no change	Unknown	Unknown. Possibly experiencing cumulative effects.
“Middle” Logan	41-42 Poor*	Monitoring found no change	Good	Possibly experiencing cumulative effects.
“Upper” Logan	20-30 Poor*	Monitoring found no substantial change	Fair to Good	Conflicting results and inconclusive.
Evers	25-64 Poor*	Unknown	Unknown	Concern. Likely outside of natural range.

* Ratings of width/depth ratio are based upon comparisons with INFISH standards, which were developed primarily in the Cascade Mountain Ecoregion. Width/depth ratios in Logan Creek are similar to most streams on the Flathead National Forest.

Habitat measurements have found inconclusive and variable results. Evers Creek may be experiencing the effects of land management and is outside the natural range. Lower Logan also may be outside of natural range due to historic logging drives in the early part of the last century. The rest of Logan Creek has mixed findings. There is not enough available monitoring information to conclude that the stream is stable or deteriorating. Historic land management practices probably resulted in some adverse effect, especially in small headwater streams that had riparian areas harvested. But streams may be healing and it is uncertain if fish habitat has been degraded.

Substrate Composition

Substrate composition refers to the materials found on a stream bottom. This stream feature is an important fish habitat parameter that will be evaluated for all alternatives because this feature of streams is likely to be affected by implementation of any of the alternatives.

Timber harvest has an indirect effect on streams by potentially increasing annual water yields when vegetation is removed, resulting in reduced transpiration. Rosgen C channels (low-gradient, unconfined channels) are particularly sensitive because they can quickly erode their stream banks while trying to adapt to increased flows, leading to an increased sediment load in the stream. Rosgen C channels are common in the Logan Creek area, and all are important for fish habitat (Exhibit G-3 has a map of Rosgen channel types). If the stream cannot flush out the increased sediment load, it may deposit in fish spawning habitat and reduce spawning success. It is impossible to predict when and where flushing flows would take place because it depends on weather patterns.

Generally, substrates with high percentages of gravel and cobble rather than fine sediment tend to have the best trout habitat. Fine sediment is defined as materials less than 6.4mm in diameter, such as organic silt, sand, clay, or very small gravel. Optimal spawning gravel size for trout varies by species, but typically ranges between 6 to 24mm in diameter.

Trout lay their eggs in the spaces between particles of the gravel substrate. If the eggs become covered with fine sediment, they suffocate (McIntyre and Rieman 1995). Furthermore, the vast majority of aquatic insects that trout depend on for food require a cobble or gravel substrate that is not packed in with fine sediment. In extreme cases, very thick fine

sediment can fill in pool habitat and bury logs that fish need for cover and rest. While it is understood that trout are adversely impacted by fine sediment, trout are still poor indicators of excessive sediment (Castro and Reckendorf 1995). Trout stream populations respond to many complex factors.

Bull trout are especially sensitive to sediment composition because juveniles require large size cobble for hiding and are displaced when the cobble is packed with fines. The Flathead Basin Commission recommends all bull trout spawning streams with over 35 percent fine sediment in spawning gravels, as measured using a McNeil Corer, be considered “threatened.” The U.S. Fish and Wildlife Service agree with this recommendation, noting that streams with this level of fine sediment within spawning gravels are not “functioning appropriately” (USFWS 1998b). No McNeil Core data exist for Logan Creek. The Flathead National Forest has assessed sediment composition in Logan Creek using the Wolman Pebble Count, a methodology that records the composition of the surface substrate layer. Pebble count data cannot be directly extrapolated to determine the quality of spawning habitat because no consistent correlation between the two has been demonstrated. However, chronic high levels of surface fines would likely result in degraded spawning gravels in the long-term.

Cutthroat trout are also sensitive to elevated levels of fine sediment, but it is difficult to pinpoint this relationship (Everest, et al. 1987) because their populations can sometimes persist even in high levels (McIntyre and Rieman 1995). Various laboratory studies found that on average, optimal spawning habitat has less than 35 percent fine sediment (Weaver and Fraley 1991, Irving and Bjornn 1984). Therefore, this EIS considers all streams containing less than 35 percent fine sediment as optimal substrate composition for bull or cutthroat trout habitat. Those with over 35 percent fine sediment have reduced habitat quality.

The 35 percent threshold is an arbitrary figure and is not necessarily linked to the natural condition of a stream. Streams are highly dynamic and cannot be defined as simply ‘baseline’ or natural. Everest, et al. (1987) compiled a literature review of the complexity and variability of fine sediment in trout streams. They noted that substrate composition varies between streams depending on watershed slope, parent material of soil (texture, erosion potential), topography, and size. Substrate composition varies within a stream based on gradient and channel roughness, such as large woody debris. Substantial variability has even been documented in a single riffle.

Fine sediment in a particular stream or reach or riffle can vary over time. Streams can either build up bedload (aggrade) or flush out bedload depending on the stream’s power and flows. In the Rocky Mountain region, events that influence the composition of the channel substrate may only take place for a few days a year or once in several years, and then the stream “settles” until the next event. This causes large variation from year to year. This natural fluctuation has been monitored on streams in the nearby Swan Valley (data available at Swan Lake Ranger District office files).

Because of the complexities surrounding fine sediment causes and effects, INFISH has no fine sediment objective (USDA Forest Service 1995b). National efforts to define a management guideline on fine sediment levels have also failed (Bauer and Ralph 2001).

The following table displays the existing condition of fine sediment in the Logan Creek area. No data exists for streams not listed below.

Table 3-49. Fine Sediment Conditions in Logan Creek Analysis Area.

Stream	Stream Substrate*	Conclusion
“Lower” Logan	Unknown. Appears to have very little fine sediment	No concern, appears within natural condition.
“Middle” Logan	10-12% (1996 survey)	No concern, appears within natural range of condition
“Upper” Logan	25-50% (2000 survey)	Concern. Some high readings.
Evers	35-44% (2001 survey)	Concern. Fish habitat is impaired.

* from Wolman Pebble Count data

Fine sediment levels above Star Meadow are high at some sites. This could be due to both natural and man-made conditions. The high water year of 1997 caused Meadow Creek, a Logan tributary, to down cut through the sediment deposited in an historic beaver pond, delivering a large pulse of fine material to the larger stream. This process of beaver pond creation, sediment filling, and subsequent release of sediments has likely occurred repeatedly in the watershed in the past. Beavers remain very active throughout the watershed, and numerous ponds are located on the main stream and many of the tributaries.

The high levels of fine sediment also could be due, at least in part, to land management. Generally, the extensive road system and past harvest activities are considered to be a source of fine sediments above Star Meadow. Research has also identified a relationship between land management activities and the cumulative effect they have on fine sediment in streams (Quigley and Arbelbide 1997; Everest, et al. 1987).

Streams in the analysis area have from 1.9 to 5.1 road miles per square mile. The upper end of this range is considered heavily roaded when judged by recommendations used by the U.S. Fish and Wildlife Service (1998b) and Inland West Watershed Reconnaissance (Exhibit G-4). Road densities this high are likely to have adverse impacts on fish habitat. A high road density may route water and sediment directly to the stream (instead of allowing runoff to percolate through the ground). If the increased water yield and sediment load are sufficiently large, the result may be increased channel width and accelerated channel erosion. Sanko Creek is the only subwatershed in the analysis area with a road density that is within acceptable limits set by U.S. Fish and Wildlife Service (1998b). It has a borderline 1.9 miles of road per square mile.

Monitoring on upper Logan Creek also implicates a relationship between increased land management activities and increased fine sediment levels. This is especially notable just upstream from the Road 313 bridge. In 1993, a survey reach in this location had 34.7 percent surface fine sediment, but a survey in the same area indicated surface fines had increased to 50.1 percent by 1999, an increase of almost 50 percent. However, this survey reach is downstream of the confluence with Meadow Creek, and the increase in fine sediment may be related to the aforementioned failure of an historic beaver pond. Caution should be used when making direct comparisons between the two surveys, as 1993 was a very wet year in the

Flathead Valley, (July of 1993 remains the single wettest month ever observed in over 100 years of records) whereas 1999 had below normal precipitation. The timing and amount of precipitation is the primary determinant of sediment transport patterns.

The WATSED model offers another indirect indicator of sediment levels. This model predicts that in most tributaries the current peak flows are from 6 to 11 percent over the modeled "baseline" conditions due to past land management activity and road construction. Elevated peak flows may result in eroded stream banks, which in turn leads to increased sediment delivery. Although, as described above, there is no way to determine a true "baseline," the WATSED model is still a useful tool.

Ironically, while some stream reaches above Star Meadow appear to have excessive fine sediment, Logan Creek itself below Star Meadow is devoid of fine sediments. The historic bull trout spawning area in "Middle" Logan is also devoid of fine sediment, but has very little spawning sized gravel (3 to 12 percent of total material). This stream appears to have tremendous runoffs every year and flushes out nearly all gravels. The high runoff may or may not be within the natural range of variation. At any rate, fish habitat is limited by too little gravel.

No habitat surveys have taken place on "lower" Logan Creek below Tally Lake. Casual observation has found it has many large cobbles and boulders and seems unlikely to have much fine sediment. Even the existing cattle grazing that takes place in this river reach appears to have no effect, because the riverbanks are full of boulders and are impervious to trampling. Undoubtedly, Tally Lake stores sediment and does not allow much to flush downstream. The stretch of the river below the lake is not used for spawning habitat.

The following conclusions are based on the available information regarding fine sediment and its impact within the watershed:

- Some stream reaches above Star Meadow appear to have elevated levels of fine sediment.
- Sanko Creek may be within the natural range of fine sediment levels due to few roads and little harvest in this watershed.
- "Middle" Logan Creek has little fine sediment and may be limited by too little spawning gravel.
- "Lower" Logan Creek is in a natural condition.

Fish Migration Barriers

Some fish migration barriers are natural (e.g., waterfalls), and others are man-caused (e.g., improperly installed culverts). Because the alternatives vary in the number of culverts proposed for replacement, effects of all the alternatives on fish migration barriers will be evaluated.

Prior to any land management, the Logan Creek area had only two natural barriers to fish movement. "Lower" Logan Creek, the outlet of Tally Lake, is a naturally slow-moving, warm water river. This may present a "thermal barrier" to coldwater species like bull trout and cutthroat trout. Trout probably did not use lower Logan Creek during summer months, somewhat isolating Tally Lake from the rest of the Stillwater and Flathead River. However,

the river could have been passable during cold years or autumn bull trout migrations. At one time, lower Logan Creek may have had more deep pools, but log drives early in the 20th century may have destroyed them. These deep pools could have sheltered coldwater trout during hot periods. Thus, any thermal barrier may have been created or exacerbated by early timber harvest methods.

The other natural barrier is the waterfall (or cascade) on “middle” Logan Creek, about three miles upstream of Tally Lake. This waterfall is three feet tall and apparently blocked bull trout, native sculpin (*Cottus* spp.), and non-native lake trout from ascending further upstream. Yet, cutthroat trout, mountain whitefish (*Prosopium williamsoni*), suckers, and redbreasted shiners (*Richardsonius balteatus*) got past this waterfall. Whitefish, suckers, and shiners are notoriously bad jumpers. It is not understood how these species got past the falls while bull trout could not.

Above the falls the cutthroat trout once enjoyed a large area with no migration barriers. This situation has changed. An inventory on all public roads in the Logan Creek area found eight culverts that are barriers to fish passage for at least a portion of the year. Originally, fish could pass through all of these culverts, but now they have become barriers to at least some life stages of fish. Over time they scoured out the stream below and fish had to jump higher and higher to get into the culvert. This habitat fragmentation blocks fish from historic spawning and rearing areas and reduces their carrying capacity.

Ironically, these barriers make little difference to cutthroat trout today, because cutthroat trout are virtually extirpated from the Logan Creek area. Nor are any culverts blocking bull trout. The barriers are simply blocking brook trout from additional habitat. Most of these culvert barriers happen to be near the upper limit of natural fish habitat, but a few are blocking substantial amounts of fish habitat. All eight culverts block a combined total of about 4.0 miles of fish habitat (out of a total of 77 miles of fish habitat in the Logan Creek area). A description of all eight barriers is in Exhibit F-13.

One existing culvert barrier may have some benefit to cutthroat trout. The culvert of road 313N over Pike Creek is near the mouth of the stream and blocks about 3.5 miles of fish habitat. A few cutthroat trout are still present in upper Pike Creek and dwell there year-round. Unfortunately, brook trout are also present in Pike Creek, but the culvert prevents any further brook trout invasion from Logan Creek. In the future, land managers may want to have this barrier in place for a cutthroat trout restoration project. No cutthroat trout recovery or expansion projects are proposed at this time, but the culvert barrier suggests that one could be attempted.

Pools

Because the action alternatives propose to build five new pools in “lower” Logan Creek, the effects of all the alternatives on the presence of fish pools will be evaluated.

Pools are deeper, slower portions of a stream created by plunges, sharp bends, large substrate, beaver dams, or scouring under large woody debris. Pools are critical to trout in that they provide feeding/resting areas for sub-adults and adults as well as over-wintering habitat. Cutthroat, bull, rainbow, and brook trout all rely heavily on the presence of large, deep pools

with heavy cover. Pools are most abundant in stable streams with large amounts of large woody debris.

INFISH provides a standard for pool abundance originally developed for streams in the Pacific Northwest. Experience within the Flathead National Forest has found that very few streams meet these objectives, even in pristine condition. Therefore, local reference stream information, which applies more to the Flathead area, has been used to modify the INFISH standards. Streams that have a comparable numbers of pools to reference streams are considered good fish habitat. Exhibit F-6 has further information about reference streams and how they are used to determine the historic range of variability.

The following table displays the available information on pool habitat in the Logan Creek area.

Table 3-50. Pool Habitat Frequency in Logan Creek Analysis Area.

Stream	Pools per 100m	Conclusion
“Lower” Logan	Unknown. Seems to have almost none.	Concern. Lack of pool habitat is probably limiting fish habitat. Pool deficiency may be due to historic log drives.
“Middle” Logan	1.2 – 2.9	No concern, within historic range of variability.
“Upper” Logan	2.7 – 4.1	No concern, within historic range of variability.
Evers	2.4 – 4.0	No concern, within historic range of variability.
Other streams	Unknown	Presumed within historic range of variability since nearly all other streams surveyed are within range.

As displayed, it appears pool habitat is not a limiting factor for most of the analysis area except for “lower” Logan, which is almost devoid of pools. This may or may not be a natural condition. At about the turn of the last century, some impressive log drives on “lower” Logan Creek may have completely altered the channel and destroyed large pools. It is equally possible that “lower” Logan Creek has always been a long continuous riffle with few pools.

At either rate, “lower” Logan Creek has sparse fish populations. Nearly all the rainbow trout (the primary game species in this river reach) are found only in the few existing pools. As a consequence, the rainbow trout fishing in “lower” Logan is poor.

Large Woody Debris

None of the alternatives proposes to remove large woody debris from streams or harvest trees that would otherwise fall into streams and become large woody debris. However, a catastrophic fire in the Logan Creek area would likely burn at least some riparian areas and change the long-term recruitment of large woody debris to streams. Because the action alternatives propose to harvest timber to reduce the overall wildfire hazard in the Logan Creek area, the effects of all the alternatives on large woody debris recruitment to streams will be analyzed for each of the alternatives.

"Large woody debris" is a catchall term that describes old root wads, fallen logs, or tree trunks that are submerged or partially submerged in the stream. In order to affect fish habitat, woody debris must be large enough to stay put in the stream during normal flow years. In small streams like Taylor Creek, large woody debris may only need to be four inches in diameter, but in larger, powerful streams like lower Logan Creek, it may need to be several feet in diameter or else the flow carries it downstream.

Large woody debris is important for trout habitat. Wood tends to be the primary mechanism for creating pool habitat in small to mid-size streams. Large woody debris is also the principal source of cover for fish. Trout need to be able to hide from predators like herons, raccoons, and other fish. Both cutthroat trout and bull trout depend heavily on cover. Generally, the more wood the better. In theory, at some point large woody debris could become excessive, detrimentally affecting fish habitat by creating migration barriers or wildland fire hazards. Research has not yet defined this level.

Comparing amounts of large woody debris in Logan Creek streams to similar streams in reference condition determine their relationship to the historic range of variability (Exhibit F-6). This analysis does not consider the INFISH standard of 20 pieces per mile. Experience on the Flathead National Forest has found that nearly all streams greatly exceed the INFISH standard. Northwest Montana streams retain more woody debris than the larger rivers in the Pacific Northwest, where INFISH was developed.

The following table displays the large woody debris abundance for Logan Creek area streams (Exhibit F-1).

Table 3-51. Large Woody Debris Frequency in the Logan Creek Area.

Stream	LWD per mile	Conclusion
"Lower" Logan	Unknown	
"Middle" Logan	43-92 pieces per mile	Unknown, no similar reference stream data. More wood may be helpful to retain scarce spawning gravels.
"Upper" Logan	193-356 pieces per mile	No concern; within historic range of variability. Monitoring indicates no change over time.
Evers	162-256 pieces per mile	No concern; within historic range of variability.
Other streams	Unknown	Presumed within historic range of variability since all other streams surveyed are within range.

Based on these figures, it is assumed that most of the existing fish habitat is not limited by large woody debris abundance. Land management activities have not changed the amount of large woody debris in the Logan Creek area streams from natural conditions.

"Middle" Logan Creek has no similar reference stream data for comparison. It is unknown if this stream is within normal range. Field visits by fisheries biologists have noted that the only available wood is piled up in large aggregates; otherwise, single pieces of wood quickly get swept downstream. "Middle" Logan Creek has tremendous runoffs that have scoured clear all spawning sized gravels. It may be desirable to retain spawning gravels. The only way to

keep gravels in the stream is to slow stream velocity. Aggregates of large woody debris can slow the velocity and store bedload. Having more aggregates in “middle” Logan could be a way to retain spawning gravels.

Fish Habitat Components Considered, But Evaluated No Further

Headwater Watershed Integrity (Unroaded Watersheds)

There is a strong correlation between watersheds with few or no roads and healthy populations of native fish (Quigley and Arbelbide 1997; USDI Fish and Wildlife Service 1998b). Fisheries managers advocate the conservation of key, undisturbed watersheds to maintain native fish, although usually the scale is for large watersheds the size of Logan Creek and not little tributaries. Logan Creek as a whole is heavily roaded, and aquatic habitat is considered “strongly fragmented” by the Interior Columbia River Basin Study. But experience on the Flathead National Forest, including nearby Good Creek, has found it worthwhile to recognize that smaller unroaded tributaries and headwaters tend to maintain remnant populations of cutthroat trout.

Four 1000-acre blocks of land in the Logan Creek analysis area have no roads (information and map available in Exhibit F-9). Two of them are within fishless watersheds, namely the small intermittent tributaries that drain east into Tally Lake and a small watershed just north of Reid Creek. Low road densities in fishless watersheds do not directly benefit native fish. The other two roadless blocks are located on Oettiker Creek and Evers Creek. Unfortunately, in both of these streams brook trout have completely displaced native fish. There is no value to native fish in retaining roadless tributaries if native species are no longer present. Therefore, this fish habitat component is not considered further.

Stream Water Temperature

Stream water temperature in part determines which fish species can exist in a stream. Stream water temperature is a key feature in understanding bull trout, cutthroat trout, and brook trout distribution. Water temperatures are controlled primarily by elevation and ground water input, but channel width and riparian canopy shading also have some influence.

None of the alternatives involve any activity that would change riparian canopy shade. All mature trees within at least one tree length of the stream would be retained in all alternatives. Some shrub slashing and pre-commercial thinning may take place near the streams in some alternatives, but these do not influence stream shade. Stream channel widths may be slightly altered by some alternatives, but none would be dramatic enough to influence water temperature. Therefore, this fish habitat component is not considered further.

Environmental Consequences

Direct and Indirect Effects

Alternative A – No Action

This alternative proposes to take no action in the Logan Creek Analysis Area and is presented as a baseline against which to compare the effects of the action alternatives on fisheries.

Specifically, the No-Action Alternative A proposes that none of the following actions occur:

- No vegetation management.
- No new road construction.
- No roads reclamation or associated actions to reduce water yield on roads.
- No application of Best Management Practices to any existing roads.
- No gating of roads for wildlife security needs.
- No replacement of undersized culverts or culverts that act as fish migration barriers.
- No construction of pool habitat in “lower” Logan Creek.
- No placing large woody debris in small tributary streams in order to improve downstream fish habitat.
- No shrub planting to improve wildlife habitat and thermal cover along streams.

(NOTE: The above activities *are* proposed in one or more of the action alternatives.)

Although the No-Action Alternative A proposes no new management activities, its implementation would affect fisheries; i.e., doing nothing does have direct and indirect effects on fish habitat and/or populations. These effects will be discussed in terms of the following parameters relevant to fisheries:

- Stream channel dimensions
- Substrate composition
- Fish migration barriers
- Pools
- Large woody debris

Stream Channel Dimensions

This alternative would cause both beneficial and adverse indirect effects to stream channel dimensions. In some ways, the No-Action Alternative would allow a gradual, natural healing of stream channels. Previously harvested areas would gradually grow over. Over several decades, small, fishless tributaries currently devoid of woody debris would grow new riparian trees to eventually help stabilize the channels. Once the small tributaries stabilize, channel dimensions would improve in downstream fish habitat. These indirect changes would be subtle and gradual.

On the other hand, implementation of the No-Action Alternative would also continue to harm stream channel dimensions because no rehabilitation and reclamation would occur on existing roads. There would be no improvements to the existing roads. Roads would continue to capture water and route it to streams, causing unnatural water yields in streams. Elevated water yields could lead to channel erosion and poor fish habitat.

The No-Action Alternative would also allow the build up of fuels across the landscape. Although efforts would be taken to suppress fires, a wildland fire would most likely occur at some time. The No-Action Alternative would increase the potential for high-severity wildland fire, with no way to predict the exact location, timing, or intensity of the fire. Burned hillsides would result in a temporary increase of stream flows, at least until the vegetation returns (Potts, et al. 1989; Simon 2000). This would cause an indirect degradation of stream channel dimensions, as they would become wide, shallow, and unstable until the slope returns to pre-fire conditions. Also, a severe wildland fire would be particularly devastating in the Sanko and Pike Creek drainages where small populations of native cutthroat trout still exist despite competition from brook trout.

Substrate Composition

Similar to the above discussion, the No-Action Alternative would allow some small improvements in substrate condition by not implementing any silvicultural or road building activities in the Logan Creek area that might provide short-term sediment delivery to streams. Also, the No-Action Alternative would allow a gradual increase of large woody debris that catches sediments and retains spawning gravels along some tributaries in “upper” and “middle” Logan Creek that have been previously harvested and are now growing trees.

However, the No-Action Alternative would also indirectly put streams at greater risk by not improving the existing condition of roads and reclaiming other roads. Poorly designed roads would continue to erode ditches and would allow road surface runoff to directly enter streams. Research has found that Best Management Practices that fix road drainage problems can be highly effective at reducing aquatic impacts (Exhibit G-5). Not all roads are equal, but failing to address “problem roads” leads to continual stream habitat degradation (Luce, et al. 2001).

Second, this alternative would have no removal or replacement of undersized culverts. Some culverts in the analysis area are too small to adequately carry flows in flood years. These culverts could potentially wash out and dump tons of sediment into the streams. There is no way to predict when or which culverts would fail, but undersized culverts are most vulnerable to failure, which could indirectly result in stream sedimentation.

Third, this alternative would allow fuel build up across the landscape and would increase the potential for a high-intensity wildland fire. There is no way to project the timing, intensity, or size of a wildland fire, but eventually one is inevitable in the Logan Creek area. A high-intensity fire can lead to landslides, debris flows, surface erosion, and scouring of wide, eroding channels, all of which cause sedimentation. In some cases a wildland fire results in devastating sedimentation (Bozek and Young 1994; Rieman, et al. 1995) and in others, change is very temporary and minor (Jakober 2001).

In summary, trout habitat in the Logan Creek Analysis area is not likely to improve with implementation of the No-Action Alternative. With the exception of “middle” and “lower” Logan Creek, streams are likely to continue to be impacted by poorly drained roads.

Fish Migration Barriers

If the No-Action Alternative were implemented, none of the 6 to 8 existing culverts that currently block upstream fish migration would be replaced. Most of the streams flowing through these culverts are overwhelmingly dominated by brook trout, not cutthroat trout. If disturbances cause the brook trout to migrate downstream to escape disturbance of some kind, the brook trout would not be able to return upstream to reclaim the stream because of the culverts that act as migration barriers. Over time, not replacing these culverts could cause a loss of up to 4.0 miles of fish habitat (out of a total of 77 miles in the Logan Creek Analysis Area).

One of the streams passing through the existing culvert barriers supports both brook trout and cutthroat trout (Pike Creek at Road 313N). While the habitat upstream may be too short to sustain a long-term cutthroat trout refugia (Hilderbrand and Kershner 2000), the culvert provides at least some short-term options for cutthroat trout conservation. The culvert barrier can be useful to protect upstream cutthroat trout from any further brook trout migration.

None of the culvert barriers affect bull trout migration. Bull trout would be unaffected regardless if the barriers stayed in place or were removed.

Pools

This alternative includes no direct installation of pools on “lower” Logan Creek, which has sparse pool habitat. Therefore, it could take decades or even centuries for the river to return to its historical condition, which likely included more pool habitat. Recreational fishing for rainbow trout, the predominant species in this area, would continue to be very poor. Native cutthroat trout are very rare in this river stretch and would be unaffected because they are primarily limited by the presence of exotic species. Bull trout are absent in “lower” Logan Creek.

Elsewhere, this alternative could lead to an indirect and gradual improvement of pool habitat. “Upper” Logan Creek and all the tributaries are much smaller than “lower” Logan and can scour new pools easily. Over time, riparian trees would die, topple into the river, and become large woody debris. Woody debris is the primary agent for scouring pools in the Logan Creek area.

It is difficult to predict the role of wildland fire on pool habitats in streams. This alternative allows fuel build-up to continue and may lead to a high-intensity fire. It is impossible to predict the size, timing, and intensity of a fire, but fire would eventually occur. Following large fires in Idaho and Montana in 1994, monitoring found that debris flows and sediment destroyed some existing pools and at the same time scoured new pools (Rieman, et al. 1997; Gardner 2002).

The net indirect effect of the No-Action Alternative is that pool habitat would gradually increase over the Logan area, except in “lower” Logan Creek. The agents of change, namely insects, diseases, and fires, are too chaotic to predict the exact rate of increase. All species of trout would benefit from increased pools through better winter survivorship, better growth, and better protection from predators.

Large Woody Debris

The No-Action Alternative would lead to a build up of insect and disease conditions across the watershed that would lead to large woody debris recruitment to streams; i.e., riparian trees gradually dying and toppling into channels. Fuel hazards would continue to be moderate-to-high throughout the analysis area. Inevitably, a wildland fire would eventually occur and possibly kill many riparian trees. Fires can lead to sudden, dramatic increase of large woody debris in streams (Gardner 2002, Jakober 2001).

Therefore, the indirect effect of this alternative is an increase in large woody debris over time throughout the analysis area. The rate and significance of this increase is uncertain because of the chaotic natural processes such as insects, disease and fire. All species of trout would benefit from more woody debris in streams.

The Action Alternatives B, C, D, E and F

The action alternatives propose varying amounts of the following management activities in the Logan Creek Analysis Area that could affect fish habitat and/or fish populations:

- **Vegetation management to reduce fuel loadings and/or to convert stands from beetle-infested Douglas-fir to other species.** Reducing the amount of vegetation on-site decreases transpiration and generally increases water yield to streams. At the same time, it helps reduce the risk of a large wildland fire. All units are within upland areas away from streams except for Unit 138A, which is in the Riparian Habitat Conservation Area (RHCA). In Unit 138A, fuel loading would be removed from 200-300 feet away from Logan Creek (Project File Exhibit F-4).
- **Prescribed burning.** Same comment as above.
- **New road construction (both system and temporary roads).** Although new roads would be built to high standards, water may collect in ditches and deposit in streams, increasing water yields.
- **Road improvements along existing roads.** Application of Best Management Practices would improve road drainage and reduce overall water yields by such actions as installing drain dips, graveling the road surface at stream crossings and rehabilitating raw cut- or fill-slopes. This also includes replacing undersized culverts that could potentially plug up and fail, releasing tons of sediment.
- **Road reclamation and associated culvert removal, recontouring, and revegetating streambanks.** Actions related to reclamation would reduce water yields; these actions include revegetating the road surface and installing water bars to route water off roads.
- **Placement by hand of large woody debris along 3.7 miles of small tributaries of Logan Creek.** Additional large woody debris would allow streams to store sediments

and stabilize banks, thereby protecting channel dimensions for fish habitat downstream.

- **Replacement of culverts that are acting as barriers to fish migration.** Some existing culverts were installed in such a way that an “artificial waterfall” now occurs on the downstream side of the culvert, which prevents fish from being able to swim upstream through the culvert.
- **Building of pools in “lower” Logan Creek to improve fisheries habitat.** Large boulders would be rearranged in this portion of Logan Creek to create stable, medium-sized pools.

The following Table 3-52 outlines the specific amounts of each of these management activities proposed by action Alternatives B, C, D, E, and F that are relevant to fisheries. A discussion of the impacts of these varying level of activities on each of the following parameters will be discussed after the table:

- Stream channel dimensions
- Substrate composition
- Fish migration barriers
- Pools
- Large Woody Debris

Table 3-52. Amounts of Management Activities Proposed by the Action Alternatives that May Potentially Affect Fish Habitat and/or Fish Populations in the Logan Creek Area.

Management Activity Affecting Fisheries	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Commercial timber harvest (acres)	6,624	4,235	4,724	6,315	5,521
Prescribed burning (acres)*	748	748	748	748	748
New road construction (miles)	9.8	6.3	7.0	9.6	8.3
Road rehabilitation (miles of existing roads)	141	99	124	138	133
Road reclamation (miles of existing roads)	16.2	16.2	16.2	16.6	16.6
Migration barrier culverts replaced (#)	8	6	8	8	8
Fish access improved (miles of stream)	4.0	3.3	4.0	4.0	4.0
Pools built in “lower” Logan Creek (#)	5	5	5	5	5
Pike Creek/Rd 313N culvert barrier enlarged, but retained as barrier	Yes	Yes	Yes	Yes	Yes
Woody debris placement (miles of stream)	3.7	3.7	3.7	3.7	3.7
Streams with channel dimension/stability concerns after alternative implementation	Bill Cyclone Pike Reid	Bill Reid	Bill Cyclone Pike Reid	None	None

* Prescribed burning acres includes 566 acres of spring season prescribed underburning and 182 acres of fuels treatment without a commercial timber harvest or underburning.

Stream Channel Dimensions

The net effect of implementing any one of the action alternatives (B, C, D, E or F) is that stream channel dimensions in the Logan Creek watershed would improve over time compared to existing conditions.

Vegetation management would occur with implementation of any of the action alternatives, and such management would increase short-term water yields in streams (See Table 3-52 to compare number of acres of vegetation management for each action alternative). This in turn would result in the stream channel dimension in certain areas becoming wider and shallower, an undesirable impact to fish habitat. The watersheds that are most vulnerable to changes in stream channel dimensions are Bill, Cyclone, Pike and Reid because of the pre-existing channel conditions. Reid Creek is especially vulnerable due to geomorphology of Rosgen C channel types. Logan Creek itself would likely not be affected by the predicted changes in water yield because they would not exceed the capacity of the larger stream.

However, varying amounts of road rehabilitation, road reclamation, application of BMPs to existing roads, and placement of large woody debris in streams would eventually reduce net water yields and help streams in the upper Logan Creek watershed return to narrow, deep channels. (NOTE: Also, reducing fuel loadings and the risk of wildland fire reduces the risk of severe water yield increases from widespread loss of vegetation.) This is particularly important in the Sanko and Pike Creek drainages where small populations of cutthroat trout still exist despite competition from brook trout.

WATSED computer modeling was done to estimate the percent water yield increases from implementation of the action alternatives. All action alternatives were estimated to cause water yield increases above baseline conditions within ranges that generally do not cause substantial channel instability:

- Alternative B: 10-15 percent increase over baseline
- Alternative C: 8-13 percent increase over baseline
- Alternative D: 10-15 percent increase over baseline
- Alternative E: 10-12 percent increase over baseline
- Alternative F: 10-12 percent increase over baseline

Concern exists about stream channel dimensions and stability of Bill, Cyclone, Pike, and Reid Creeks. These four tributaries have experienced high water yields within the past decade and have somewhat unstable channel conditions. The four action alternatives differ in their effects on these four streams. Only Alternatives E and F have the array of features whose implementation would minimize or eliminate concern about all four of these creeks (see Table 3-52).

Alternatives E and F differ from the other alternatives in the roads proposed for reclamation. Alternatives E and F propose 16.6 miles of road reclamation, just 0.4 mile more than the other action alternatives (Table 3-52). More importantly, the location of roads that these alternatives propose for reclamation is quite different than Alternatives B, C, and D. Proposed reclaimed roads were chosen in Alternatives E and F for maximum improvement in stream channel conditions, following the recommendations of Luce, et al. (2001). The road reclamation scheme proposed by Alternatives E and F would contribute to a substantial improvement of channel conditions above and beyond the other alternatives in the following creeks: Pike, Meadow, Sanko, Cyclone, and Reid.

Substrate Composition

The net effect of implementing any of the action alternatives is that sediment delivery to streams would decrease to lower levels than currently exist, and this reduction would occur sooner from implementing an action alternative (Alternative B, C, D, E or F) than implementing the No-Action Alternative.

Temporary, minor sediment delivery would occur as a result of new road construction, timber harvest, and replacing culverts. The sedimentation would last a matter of a few hours (culvert replacement) to a few years (as harvested timber lands revegetate). The greatest potential source of sedimentation is usually where new roads cross a perennial stream, but this will not occur in any action alternative. Only one stream crossing is proposed; this is on temporary road #3 as it accesses Unit 24. This stream crossing is on an intermittent channel that has no surface water connectivity to anything and thus has no potential for sedimentation in downstream fish habitat. Furthermore, it should be noted that timber harvest practices seldom result in direct erosion, especially when riparian areas are unharvested, such as proposed for all action alternatives (Everest, et al. 1987). Rather, timber harvested has a subtle, indirect effect as it leads to changed water yields, which in turns causes the stream channels to widen and erode. This is not expected to be a substantial problem because modeled water yields are below thresholds of concern (see Water Resources discussion). The only drainages that may experience adverse affects on substrate composition would be Reid, Pike, Cyclone, and Bill Creeks in Alternatives B, C, and D.

However, the road rehabilitation and reclamation actions as well as application of BMPs and replacing culverts would lead to long-term decreases of sediment delivery to streams. The exact magnitude of these reductions to sediment delivery is impossible to quantify because of natural conditions such as weather and flow patterns and geomorphology of each stream.

Vegetation management actions proposed by all the action alternatives would reduce the risk of wildland fire and the resulting potential for massive sediment delivery to streams associated with high peak flows after fires. The more vegetation management proposed, the less the wildfire risk. All the action alternatives reduce the risk of wildland fire more than the No-Action Alternative. See Table 3-52 to compare the number of acres of vegetation management treatment among alternatives; the more acres, the lower the risk of wildland fire.

Readers may compare among alternatives the management actions that would affect fish habitat and/or populations (Table 3-52). Some alternatives propose more vegetation management—a negative effect on substrate composition—than other alternatives, but may not propose as many miles of road reclamation or rehabilitation—a positive effect on substrate composition. Overall, any one of the action alternatives would cause a long-term reduction in the amount of sediment delivery to streams, after a temporary increase in sediment delivery because of road construction, culvert removal, and the like.

Fish Migration Barriers

The action alternatives vary in the number of culvert barriers to fish migration that would be replaced. Details about each barrier and the length of upstream habitat it blocks can be found

in Exhibit F-13. The action alternatives vary in number of culvert replacements due to varying haul routes needed:

- Alternative B, D, E, and F (total of 8 culvert barriers replaced): Cyclone, Reid (2), North Fork of Oettiker, Taylor, unnamed tributary of Meadow, unnamed tributary of Evers, and Pike Creek.
- Alternative C (total of 6 culvert barriers replaced): Cyclone, Reid (2), Taylor, unnamed tributary of Evers and Pike Creek.

By replacing culvert barriers, Alternatives B, D, E, and F each would open up 4.0 miles of stream to fish migration; Alternative C would open up 3.3 miles. All the action alternatives would involve replacing the culvert on Pike Creek across Road 313N with a larger culvert, but would retain the migration barrier feature to protect the cutthroat trout in two miles of Pike Creek upstream from the culvert from upstream invasion of brook trout. It also would facilitate those two miles of Pike Creek becoming possible cutthroat trout refugia sometime in the future if funds become available to eliminate the existing brook trout population.

Pools

Each of the action alternatives involves building five pools in “lower” Logan Creek where there is currently a long, continuous riffle with few fish. The lack of pools in this stretch primarily limits fish habitat. The long-term effect of building these five pools would be a dramatic increase of rainbow trout numbers and sizes in that half-mile stretch. Recreational fishing would also likely increase in this stretch because a trail in the Round Meadows Ski Area would provide access to these pools. Anglers might remove large fish, but the overall rainbow trout population would still improve in size and numbers in “lower” Logan Creek. This action would have no affect on native fish species because they are essentially absent in “lower” Logan Creek.

Large Woody Debris

None of the action alternatives proposes any harvest within a tree length of any stream, so vegetation management associated with the action alternatives would not reduce recruitment of large woody debris in streams. Research has found that protecting riparian areas from harvest is crucial to allow the stream the proper abundance and function of woody debris (Hauer, et al. 1999; USDA Forest Service 1995b).

The action alternatives were designed to reduce the potential for a large intense fire, which would kill trees and provide a good source of woody debris recruitment to streams. However, the action alternatives would allow for natural growth, mortality, and decay of riparian stands, which would supply sufficient large woody debris to provide for cover and pool formation (Ralph, et al. 1994). The net effect of any of the action alternatives is that woody debris would gradually increase and maintain itself, just like historical conditions, providing cover and pool habitat.

Cumulative Effects

Introduction

The cumulative effects analysis considers the alternatives in light of past, present and reasonably foreseeable actions. This allows an understanding of how implementing the alternatives may or may not impact the fish populations. The analysis area for cumulative effects includes the entire Tally Lake drainage, meaning Logan Creek along with Sheppard and Griffin Creeks. Any potential change to fish populations would be detected at this scale, not at the scale of the entire 2.6 million-acre Flathead Lake basin.

The introduction of exotic fish species has had the single greatest detrimental impact upon native fish. As described in the Affected Environment section, historical fish stocking practices resulted in great harm to native fish. Brook trout out-compete juvenile cutthroat trout. Rainbow trout can hybridize with cutthroat trout. Lake trout directly prey on bull trout and cutthroat trout. There is no present or reasonably foreseeable fish stocking of exotic species in the analysis area, but the damage has already been done.

Other past actions in the Tally Lake area that have affected fisheries resources include timber harvest and road construction on federal, state, and private lands. As described in the Affected Environment section, these activities have adversely impacted stream channel dimensions, substrate composition, and fish migration patterns. Past log drives on “lower” Logan Creek may have also eliminated some pool habitat.

Some past, present and reasonably foreseeable actions have had and are expected to have little to no impact on fisheries resources:

- Present firewood cutting and opening select roads in the future to allow firewood cutting.
- Noxious weed control activities (Flathead National Forest 2001).
- Hand thinning of small-sized, overly stocked trees.
- Recreational activities such as trapping, hunting, driving for pleasure, snowmobiling, camping, hiking trails, mountain biking, and recreational boating on Tally Lake.
- The relocation and reconstruction of Trail 800.
- Construction of new trails in the Round Meadows Ski Area have no impact to fish habitat, but they may increase recreational fishing pressure in “lower” Logan Creek.
- Angling has caused no ongoing or future effects to bull trout because fishing for the species is prohibited.
- Historical fishing for cutthroat trout may have caused some initial declines in population, but few anglers harvest cutthroat trout in the Tally Lake area today. “Lower” Logan Creek has only non-native species today, and increased fishing pressure would not harm them or harm native fish.

There are three on-going public cattle grazing allotments in the Tally Lake area. The Chinook Allotment is located on the “lower” Logan Creek. This river has large cobbles and boulders along its bank, and inventories have never found any evidence that this allotment adversely affects fish habitat. The Swaney Allotment is within the headwaters of Sheppard Creek. Past

and present management presumably caused some bank trampling and sedimentation in Sheppard Creek. The Island/Squaw Allotment is on upper Griffin Creek. Monitoring has verified this allotment negatively affects fish habitat due to bank trampling, which causes channel widening. These allotments are expected to continue in the future and are scheduled for management review, but there are no reasonably foreseeable actions at this time that would improve the situation.

There are substantial amounts of small, private land along “lower” Logan Creek, Evers Creek, and the Star Meadow area. Most of these landowners have built residences and have cleared some land. In general, stream channels have been left in natural conditions, and fish habitat has not been impaired. Some further subdividing is possible in the Star Meadow area, but no adverse impacts are expected. Plum Creek Timber Company is a landowner in the extreme headwaters of Logan Creek. They have built roads and harvested most of the area, resulting in increased sedimentation and water yield to “upper” Logan Creek. Plum Creek plans to selectively harvest another 850 acres in the next few years, although they do not intend to build any more new roads. Plum Creek usually does well in timber harvest practice audits, and it is reasonable to assume that Plum Creek would continue to adhere to good timber harvest practices. The reduction in vegetation may lead to slightly increased water yield in “upper” Logan Creek.

Road maintenance on open roads is likely to continue. Road maintenance includes blading, brushing, and inspecting culverts. These actions often lead to short-term, small increases of sediment as the blading of the road surface pushes sediment into ditches. However, road maintenance keeps the culverts from plugging with debris and washing out the road, preventing much greater potential input of sediment.

A cutthroat trout restoration effort on upper Sheppard Creek is on-going and would probably continue in the future. This effort involved building a barrier on Sheppard Creek to block any further brook trout invasion. Brook trout are being systematically removed from the stream by electro fishing and releasing the cutthroat trout unharmed. This action should result in dramatic improvements to cutthroat trout numbers in upper Sheppard Creek, providing these seven miles of fish habitat with a stable, secure cutthroat trout population.

The Sheppard and Griffin watersheds have had several miles of roads reclaimed or brought up to better standards since the mid 1990s. Further road reclamation is still planned in the Griffin Creek drainage. These activities would gradually reduce sedimentation and water yields into the Sheppard and Griffin Creeks and improve fish habitat over time.

It appears that past and present fire suppression activities have not yet impacted fisheries resources in the Tally Lake area. This is based on the findings that the streams are not limited in woody debris or pool habitat (except for “lower” Logan Creek). Furthermore, there is no evidence that fire suppression activities have led to any direct impacts; i.e. no fire line erosion or pollution. However, it seems logical that indirect effects from fire suppression would occur over time. Streams need occasional disturbances in order to gather new wood and scour new pools. Preventing fires and allowing fuel buildup could ultimately lead to a large, high intensity fire. This could have both a beneficial and an adverse effect. New woody debris would likely result in additional pool habitat, but the streams may also experience short-term

but devastating sediment flows, widening of the channel, and possible local extirpation of fish.

Reduced habitat quality and extreme isolation of native fish make it undesirable to have a large, intense wildland fire sweep across the drainage. Cutthroat trout and bull trout could survive periodic “house cleaning” from historic fires because they had good complex fish habitat and could freely migrate and repopulate a burnt drainage (Reeves, et al. 1995). This situation does not exist in the Tally Lake basin today. The remaining native fish may not be able to persevere after a fire. Researchers advocate restoring habitat and habitat connectivity and diminishing the risk of a large wildland fire, especially an unusually intense fire (Rieman and Clayton 1997; Rieman, et al. 2002). The small remnant cutthroat trout populations that remain in Sanko and Pike Creeks are moderately at risk to a wildland fire. They are afforded some protection due to previously thinned areas and moist riparian vegetation.

The No-Action Alternative

The No-Action Alternative does not include further timber harvest or road construction, thus allowing some gradual healing of stream channel dimensions and substrate composition. The No-Action Alternative would not alter the moderate risk of wildland fire to the small cutthroat trout populations that remain in Sanko and Pike Creeks.

The cumulative effect of the no action alternative along with past, present, and reasonably foreseeable actions is that it would not aggressively solve problems. This alternative does provide “protection” of habitat; i.e., it does not make anything worse, but it is not enough to recover native fish populations. The cutthroat trout populations of Logan Creek area would likely disappear due to relentless pressure from exotic fish or perhaps a wildland fire. The cutthroat trout in upper Griffin Creek may or may not persist due to extremely poor habitat and prolonged drought. Over time, the only cutthroat trout population that may be left in the Tally Lake area is upper Sheppard Creek. Bull trout will remain very rare in the analysis area.

Brook trout would continue to thrive throughout the cumulative effects area. Brook trout are currently doing well in spite of reduced habitat quality. A large wildland fire poses no risk to brook trout because they are extremely abundant and can access all habitats. The only exception is that about eight miles of habitat upstream of certain culverts may be blocked to their use.

Rainbow trout would not be cumulatively affected by implementation of this alternative. Rainbow trout are found in “middle” and “lower” Logan Creek. Recreational fishing opportunities for brook trout and rainbow trout would generally remain as status quo.

The No-Action Alternative would not threaten species viability despite potential declines of cutthroat trout in the analysis area. Cutthroat trout and bull trout would continue to be viable populations in the Flathead Lake basin (Exhibit F-10).

Action Alternatives B, C, D, E, and F

The cumulative effects analysis considers the proposed action alternative in light of past, present, and reasonably foreseeable actions.

In general, the cumulative effects of implementing any one of Alternatives B, C, D, E, or F along with past, present, and reasonably foreseeable actions is that it would help to gradually restore fish habitat conditions. The indirect, beneficial effects of these alternatives would help improve channel dimensions in most tributaries, reduce sediment, improve habitat connectivity, and increase pool habitat. However, restoring fish habitat alone would not be sufficient to recover native fish like cutthroat trout. None of the action alternatives (nor the No-Action Alternative) addresses the single greatest threat to native fish: the presence of exotic species.

Past actions have included many miles of road construction, which has led to reduced channel dimension integrity and sedimentation. The action alternatives propose a varying amount of new road construction, road reclamation, and road rehabilitation (see Table 3-52). No further road construction is expected on Plum Creek Timber Company lands. Some driveways may be built on small private landholdings. On-going road maintenance would help keep culverts clear of debris, but would also lead to slight sedimentation each time a road is bladed. The cumulative effect of roads on aquatic resources would decrease. Roads would continue to be present, but would contribute less to elevated water yields and sediment in streams than the current condition.

The action alternatives propose varying acreages of vegetation management (See Table 3-52). Historic timber harvest activities were more aggressive and harmful to aquatic resources than modern practices. Research has found that timber harvesting that does not enter riparian areas and protects soil moisture, such as proposed in all action alternatives, can protect aquatic resources (Quigley and Arbelbide 1997, USDA Forest Service 1995b). It is not anticipated that the reasonably foreseeable harvests on Plum Creek and private lands would lead to problems. Models indicate no stream has water yields beyond levels recommended, but there is concern that Bill, Cyclone, Pike, and Reid Creek may not be able to handle any more water yield regardless. If Alternatives B, C, or D were implemented, the poor channel condition of at least two of these four streams would be perpetuated and the streams would not have a chance to heal. Only Alternatives E and F would minimize or eliminate concern about all of these four streams (Table 3-52).

All the action alternatives would restore fish habitat connectivity to between 3.3 and 4.0 miles of streams that are currently blocked by poorly designed culverts. The cumulative effect of this is improved resiliency and population size for brook trout. Brook trout are the only species present near these barriers and the only species that would benefit.

All action alternatives include adding new pools to lower Logan Creek. This may help restore the stream from what is perceived as a lingering effect from old log drives. Rainbow trout, the most abundant species in lower Logan Creek, would have increased population numbers and individual size as a result.

All action alternatives involve vegetation management that would help reduce the likelihood of a large, high-intensity wildland fire. As described for the No-Action Alternative, a big wildland fire has both beneficial effects (adds new wood and pools) and harmful effects (risks devastating sediment and debris flows and loss of channel integrity). Due to the existing reduced habitat quality and extreme isolation of native fish, it seems that the best way to protect native fish is to avoid large, high intensity fires in the Logan Creek area. Cutthroat trout may not be able to persevere after a fire. Researchers advocate restoring habitat and

habitat connectivity while diminishing the risk of a large wildland fire, especially an unusually intense fire (Rieman and Clayton 1997; Rieman, et al. 2002). The action alternatives do that, to varying degrees depending on acres treated (See Table 3-52). The remnant cutthroat trout populations in Sanko and Pike Creeks would be at less risk from catastrophic wild land fire due to the proposed fuel reduction and thinning projects near these drainages.

Thus, in light of all past, present, and reasonably foreseeable actions, the quality of fish habitat in the Tally Lake cumulative effect drainage should improve gradually through implementation of any of the action alternatives. Although Alternatives E and F would particularly address concerns about Bill, Cyclone, Pike, and Reid Creeks, all action alternatives would improve the other tributaries of Logan Creek by providing more stable channels, better spawning habitat, improved connectivity, and sufficient pool and woody debris. On-going road reclamation in Sheppard and Griffin would help the cumulative improvement. The risk of a large, intense wildland fire would be reduced. Brook trout and rainbow trout, the most common species in the cumulative effects area, would benefit from improved habitat. The only on-going problem for fish habitat would be the lingering effect of high road density and the Swaney and Island/Squaw grazing allotments that would occur no matter which action alternative were implemented.

While the cumulative effects from any of the action alternatives would help protect and restore fish habitat, it is not enough to recover native fish. Cutthroat trout populations of the Logan Creek area would likely disappear over time. Currently cutthroat trout are only found in Sanko and Pike Creeks. The action alternatives may help “buy time” in that they help reduce the threat of wildland fire in these drainages, but ultimately this is not enough. The key problem is the presence of non-native species, and the action alternatives do not alter this situation in any way. Furthermore, the cutthroat trout in upper Griffin Creek may or may not persist due to extremely poor habitat. The fish in Griffin Creek are especially vulnerable to a prolonged drought and are not helped by the on-going Island/Squaw grazing allotment. Over time, the only cutthroat trout population that may be left in the Tally Lake area is upper Sheppard Creek. Sheppard Creek is the only stream in the cumulative effects area that has a cutthroat trout restoration project (namely removal of non-native species).

None of the action alternatives would harm bull trout, but neither would any of them do enough to recover bull trout in the Tally Lake area. Bull trout are primarily threatened by exotic species in Tally Lake, and none of the action alternatives would change that situation. If bull trout still occur in the watershed, their numbers are extremely low, and it is unlikely this species would persist in the analysis area.

Despite potential declines of cutthroat trout and possible disappearance of bull trout in the analysis area, none of the action alternatives combined with other past, present, and reasonably foreseeable actions would threaten species viability. Cutthroat trout and bull trout would continue to be viable populations in the Flathead Lake basin (Exhibit F-10).

REGULATORY FRAMEWORK AND CONSISTENCY

Three government agencies share responsibility for managing the fishery resource. The U.S. Fish and Wildlife Service is a regulatory agency for federally listed species and seeks to

recover these species in conjunction with other agencies. The Montana Department of Fish, Wildlife, and Parks (MDFWP) has primary responsibility for fish populations. Management of fish habitat on National Forest System lands is largely a Forest Service responsibility. All three agencies cooperate in research and monitoring efforts.

The Flathead National Forest must take several regulatory steps. All alternatives reviewed fully comply with all regulations. The following paragraphs review each step and the compliance.

- The U.S. Fish and Wildlife Service has determined bull trout (*Salvelinus confluentus*) is a federally threatened species. It is the only federally listed fish species in the analysis area. A biological assessment is required for significant federal actions that may impact bull trout. This would be prepared for the selected alternative and will be in Exhibit F-2. Consultation with the U.S. Fish and Wildlife Service is a requirement for any federal actions that could potentially affect bull trout.
- The Regional Forester has determined that westslope cutthroat trout is a sensitive species on National Forest System lands. The Forest Service seeks to protect their habitat and prevent population declines that would lead to protection by the Endangered Species Act (FSM 2670). A biological evaluation is required to evaluate the effects on these sensitive fish species and this is in Exhibit F-3. The no action alternative has been determined to have “no impact” on cutthroat trout. All four action alternatives have been determined that they “May impact individuals or habitat, but will not likely result in a trend towards federal listing or reduced viability for the population or species.” This is because all action alternatives have some short-term, adverse impacts to fish habitat. Ultimately all four action alternatives would improve fish habitat, but not sufficiently to recover the species and be considered “beneficial impact.”
- The Flathead National Forest LRMP determined bull trout and cutthroat trout are management indicator species for all other fish species and prohibited “unacceptable fish losses” from land management activities (page II-21) in all management areas. All alternatives comply with this direction. Land management activities proposed in all four action alternatives would not result to fish losses in any tributary. This does not mean that fish losses won’t occur; in fact, it is expected that native bull trout and cutthroat trout would ultimately disappear from the Logan Creek area. The decline of native fish is due to circumstances that are outside the role of land management (i.e. exotic fish species).
- In 1990, the Forest adopted Amendment #3, which added more trout stream standards. Certain standards were developed for key bull trout streams (none of which are in this analysis area). It also sets four management standards for all streams known to contain westslope cutthroat trout. The first three standards deal with acceptable amounts of management activities in riparian areas, stream shading, and identifying and controlling sediment sources. The action alternatives meet these standards. The proposed activities have extremely little activity in riparian areas (see information on INFISH compliance), provide plenty of stream shade, and seek to control sediment sources by improving the road system and prohibiting streamside harvest. The fourth standard

seeks to pursue opportunities to recover cutthroat trout populations. The 2001 Logan Creek EAWS determined it would not be practical to recover cutthroat trout in the Logan Creek area and recommended efforts focus on Sheppard and Griffin Creeks. Therefore, cutthroat trout restoration has not been proposed as a purpose and need for the Logan EIS.

- In 1992 the forest published Implementation Note 10, which further set directions regarding fine sediment in key bull trout streams. None of the key bull trout streams are found in this analysis area.
- In 1999, the Regional Forester signed the "Conservation Agreement and Management Plan for Westslope Cutthroat Trout in Montana." This conservation agreement has five objectives, of which the first three are relevant to National Forest System lands. The first objective is to protect all genetically pure populations. The second objective is to protect all populations that are only slightly ingressed (90 percent pure). The third objective is to recover cutthroat trout in several large watersheds (at least 50 miles of habitat) across the state. The genetic purity of cutthroat trout in Logan Creek is unknown and they are assumed pure until found otherwise. The action alternatives do not harm fish habitat; they vary mostly in how much gradual, cumulative benefit they would have on habitat. While the proposed action does not seek to recover cutthroat trout, it does provide protection of habitat.

In 1995, the Forest Service adopted INFISH as a means of recovering native fish populations, and it became a part of the Flathead National Forest LRMP. Numerous "priority" watersheds were established to recover bull trout, but none of these are in the analysis area. The goals of INFISH are to maintain or restore riparian habitat and aquatic resource values on National Forest System lands. In order to achieve these goals, several riparian management objectives have been outlined. Activities must not retard the attainment of these objectives. It is permissible to conduct activities within riparian areas (RHCAs) as long as the standards and guidelines are met and riparian management objectives are achieved. It is also permissible--even encouraged--to modify the riparian area widths based on local, relevant information. The action alternatives all comply with this direction. All alternatives have modified the standard riparian widths and excluded from riparian areas all but one unit: Unit 138A, which would involve some activity in the RHCA. This has been evaluated to be beneficial and does not retard any management objectives. Exhibit F-4 is a site-specific analysis for these changes.